COMMONWEALTH OF VIRGINIA
DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION

ECONOMIC ASSESSMENT OF A ROANOKE REGION INTERMODAL FACILITY

FINAL REPORT

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KEY FINDINGS

This report, prepared by HDR/HLB Decision Economics for the Virginia Department of Rail and Public Transportation, assesses the local economic impact of a proposed intermodal facility to be located in the Roanoke Region of Virginia. The facility would be operated by Norfolk Southern (NS) and constructed with support from public funds. Several candidate sites have been identified and all are within a 20 minute drive from each other. Facility operations and market impact are assumed to be the same for each facility with a steady-state annual demand of 28,500 lifts of twenty-foot container equivalent units (TEU) that would be reached after 15 years of steady market penetration. Container boxes vary in length – with the vast majority (78%) being 40 feet in length (2 TEUs). The 28,500 annual TEU lifts estimated for the intermodal project equates to approximately 15,000 individual container lifts per year. Public benefits of the facility are assessed as part of the entire Heartland Corridor Initiative, which is assumed to generate an additional 150,000 containers at the steady-state. Facility construction costs would be supported by a matching 70% grant through the Commonwealth of Virginia's Rail Enhancement Fund.

Key findings in the report indicate that the economic impact from an intermodal facility would grow over time as more businesses realize shipping cost savings, and new businesses move into the area. By assessing the experience of other facilities in the U.S., the steady-state level of operations at the proposed facility (15,000 container lifts) could increase the region's annual employment positions between **740** and **2,900**. These positions would be achieved from the combined direct, indirect and induced economic stimulus across a broad spectrum of related industries. To reach this level of jobs, economic development is assumed to growth steadily for 15 years. After year 15, the annual number of employment positions due to this facility is not expected to change.

The total annual economic output associated with economic development and job creation reaches between **$140 million** and **$550 million** at steady-state operations. The corresponding tax revenue of this impact would be between **$18 million** and **$71 million**. The additional annual economic output from facility operations alone is a much smaller range (**$3.5 - $5.3 million**). Finally, an additional one-time economic impact of building the facility depends on the total cost and could range between **$38.6 million** and **$57.9 million**.

Over thirty years, these short- and long-term estimates of cumulative economic output from this project would generate a present value of between **$1.5 billion** and **$5.5 billion.** In addition, the project would stimulate between **15,600** and **59,500** job-years over this 30-year period (a job-year is a job that lasts a year; it is not the same as an employee who may keep the same job).

The public cost-benefit analysis results indicate that the entire project, including tunnel clearances and the intermodal facility, yields a positive net benefit for the state. For the 15- and 30-year planning horizons, the benefit-cost ratios are **4.0** and **6.8** respectively (a ratio of 1.0 is generally considered a minimally acceptable value). Net present values are **$100 million** and **$193 million**, respectively. The internal rates of return are well above 20% and the investment payback would be achieved in about five years. The majority of benefits are realized from reduced accident costs and pavement maintenance costs.

Results of this analysis indicate that the intermodal facility would provide a strong economic stimulus to the region. IKEA's decision to locate its Swedwood unit in Virginia was partially attributable to the planned facility. The Heartland Corridor Initiative and intermodal facility stand to generate substantial public benefits for the state. It may be noted that if the state does not invest in the intermodal facility or delays investment for 10 or 20 years, the potential economic impacts could be reduced because the other intermodal facilities along the Heartland Corridor would solidify their market presence.

1. INTRODUCTION

1.1 Background

With its highways, railways, airways and waterways, the nation's freight transportation system plays a critical role in an increasingly global economy. While trucks are still moving a majority of the nation's freight, the demand for freight rail transportation is on the rise, especially in response to increased road congestion. According to the Association of American Railroads (AAR), rail traffic set a new record in 2006 with an estimated 1.77 trillion ton-miles, a 4.4 percent increase over 2005. Intermodal traffic (containers and trailers) itself was up by 5.0 percent. "Intermodal" refers to any shipments that are carried by more than one mode, such as rail and truck. Intermodal rail is typically limited to the carriage of truck trailers (with wheels) and containers (without wheels).

A number of reasons can be given to explain this unprecedented surge in the demand for rail transport: the boom in international trade (especially with China and other Asian countries), technological advances in railroad equipment (such as double-stack rail technology), highway congestion (and its related social, economic and environmental costs), and the rising costs facing the trucking industry.

Trade flows are changing, resulting in greater demand for access into and out of East Coast ports. Reasons for these changes include congestion and disruptions at West Coast ports, increased efficiency of shipping, and expected expansions of the Panama Canal. These conditions create a climate of new competition among East Coast ports to capture the larger market share.

The success of freight rail nationwide relies primarily on its infrastructure, and particularly its network of intermodal facilities. A new generation of intermodal facilities, the largest of which are called integrated logistics centers, has emerged over the past decade. These facilities differ from traditional rail yards, handle higher-end consumer products, and can not only foster economic activity but can also generate positive developmental and economic effects for the community at large. Some facilities offer on-site rail access and warehousing capability.

1.2 Purpose of Report

The purpose of this report is to assess the potential economic and community benefits resulting from the construction and operation of an intermodal facility in the Roanoke Region of Virginia. These benefits include increased economic output, jobs and tax revenue. This report does not include an assessment of the cost of such a facility in terms of potential increases in highway traffic, opportunity costs, or loss of open space.

The report is organized into four chapters. After this brief introduction, Chapter 2 provides a description and a comparison of existing facilities in the United States. Chapter 3 examines the various benefits associated with such facilities. Chapter 4 provides a quantitative analysis of economic impacts and a discussion of potential benefits and costs.

In addition, the report includes several appendices. Appendix A provides a socioeconomic profile of the study area. A table summarizing all of the benefits of integrated logistics centers is included in Appendix B. References and data sources used throughout the report are provided in Appendix C.

2. HEARTLAND CORRIDOR AND INTERMODAL FACILITIES

2.1 Overview

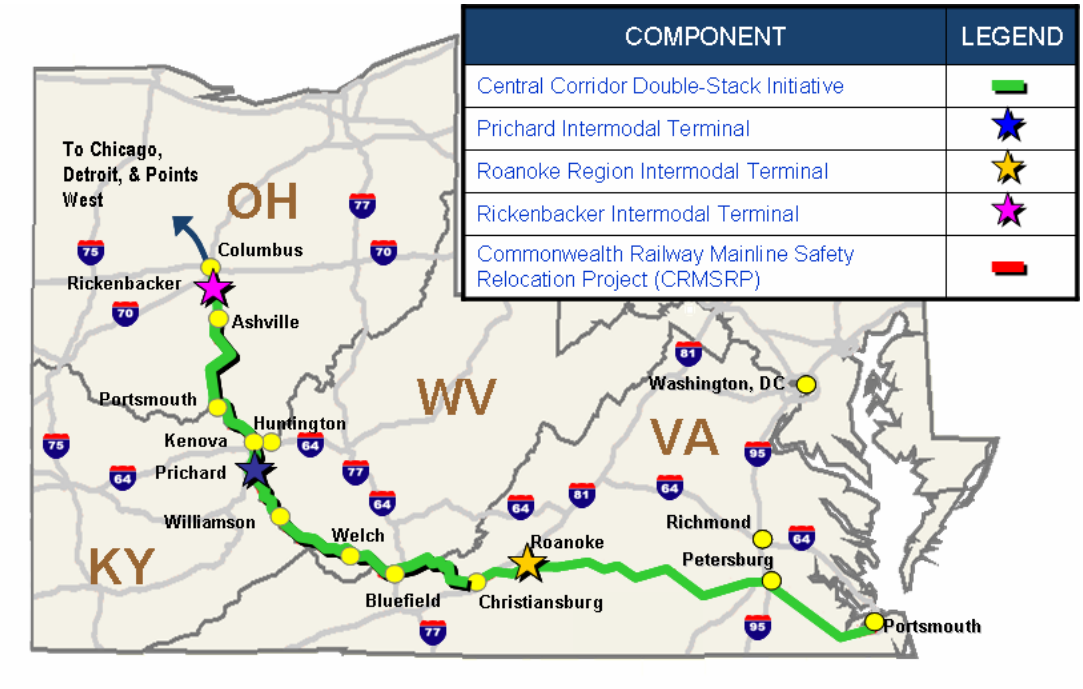
An intermodal facility in the Roanoke Region is planned as part of the Heartland Corridor Initiative. Planned improvements on the Heartland Corridor include improving the clearance of 24 overhead obstructions and bridges in West Virginia and Ohio in addition to increasing the height clearance in 28 tunnels in Virginia, Kentucky, and West Virginia. The Heartland Corridor Initiative provides a shorter time, double-stack train route on the Norfolk Southern network extending from the Port of Norfolk through Columbus to Chicago.

The Heartland Corridor is a more direct route for double-stack freight and would reduce the travel length by 120 to 370 miles (depending on the origin location and which of the other routes is used) for double stack shipments on NS routes. Currently, double-stack trains travel north through Maryland before heading west because the corridor through western Virginia, West Virginia, Kentucky, and Ohio only accommodates conventional multi-level cars and single stack container cars. Several new intermodal facilities are proposed for this improved route, including one in the Roanoke Region. The total cost of the clearance improvements is currently estimated at $150 million. Construction will take place through 2010.

For the purpose of this economic assessment, the Virginia share of costs for the entire project could potentially be $35.2 million which includes a 70% share of the total intermodal facility cost, or $25.4 million, plus $9.75 million as the state contribution to tunnel clearances.

In addition to the double-stack clearance between Roanoke, VA and Columbus, OH, realization of the double-stack clearance complements other on-corridor projects, such as the Commonwealth Railway relocation to serve the APM/Maersk and Craney Island terminals, and the intermodal facilities at Rickenbacker, OH, Roanoke, VA and Prichard, WV.

Figure 1: Map of the Heartland Corridor



2.2 Description of Proposed Intermodal Facilities

2.2.1 Roanoke Region Intermodal Facility

Ten sites have been evaluated for the location of an intermodal facility in the Roanoke region. Each of these sites has advantages and disadvantages. Differences in sites include land availability, access to local infrastructure and markets, and their relationship to major truck traffic corridors. All of the sites are located on a section of NS track that carries north-south I-81 freight (Crescent Corridor) and east-west freight (Heartland Corridor). More information on the study area is provided in Appendix A.

The evaluation for a candidate site assumes the same terminal operational capacity in terms of annual twenty-foot Truckload Equivalent Unit (TEU) lifts. Warehouses are not expected to be located on-site and the facility will mostly serve as a freight terminal for picking up and dropping off containers. There could be a small amount of container storage on-site. In contrast with the Virginia Inland Port (VIP) located along the I-81 corridor north of the Roanoke Region in Front Royal, VA, customs service is not expected to be provided at the Roanoke facility. The main difference in these sites is construction cost.

For evaluation purposes of this report, Table 1 shows the approximate driving distances and times between three potential intermodal facility sites, Elliston, Colorado Street, and Garman Road (formerly Virginian), and some of the economic centers in the surrounding area that could benefit from an intermodal facility in the Roanoke Region. All travel times assume non-peak traffic flow conditions. Differences in driving times range between three and 16 minutes. The comparative advantage in site location as it affects travel time is minimal since the sites are less than 12 miles apart. Should one site be closer to manufacturers who would adjust their shipping practices to use the intermodal facility, or if one site has the potential for more development of new manufacturing in the immediate vicinity, then that location may have a greater effect on travel time.

Table 1: Driving Times and Distance to Facilities from Roanoke Region Cities

Local Area Driving Time and Distance Matrix									
		Roanoke	Salem	Martinsville	Lynchburg	Buena Vista	Covington	Radford	Danville
Elliston Site	Distance (miles)	20.5	10.5	71.9	74.8	63.4	63.9	28.5	93.7
	Travel Time (hours)	0:25	0:16	1:32	1:30	1:07	1:24	0:33	2:03
Colorado Street Site	Distance (miles)	6.3	1.8	54.4	61.2	55.3	55.8	40.6	73.9
	Travel Time (hours)	0:18	0:07	1:19	1:26	1:04	1:21	0:49	1:53
Garman Road Site	Distance (miles)	15.4	4.4	66.8	69.6	58.3	58.7	33.2	88.4
	Travel Time (hours)	0:22	0:10	1:30	1:27	1:04	1:21	0:39	2:01

Source: http://maps.google.com

2.2.2 Other Proposed Intermodal Facilities on the Heartland Corridor

The Rickenbacker Airport in Columbus, OH is an international multimodal cargo airport with Foreign-Trade Zone (FTZ) status that serves as a national and international distribution hub. The facility also is a high-speed international logistics hub with a strategically planned cargo complex that serves several key business segments, including international airfreight, freight forwarding, corporate aviation, e-commerce fulfillment, and distribution. The Columbus Regional Airport Authority has partnered with NS to create an intermodal facility adjacent to the Rickenbacker Airport property. The new Rickenbacker Intermodal Facility is currently under construction, and is expected to be operational by early 2008. The facility will relieve pressure on the area's existing intermodal facility at Discovery Park. Discovery Park has been operating at capacity for several years, forcing Norfolk Southern to turn away business from the Central Ohio region. The facility is projected to handle over 300,000 container lifts per year. The preliminary benefits estimated for the Rickenbacker Intermodal Facility include:

- Transportation cost savings to shippers are estimated at $660 million over the first 10 years of operation.
- Truck mile reductions of 49 million in Ohio.
- Emissions reduction (not measured).
- The intermodal facility will add 9,500 direct jobs and 10,900 indirect jobs over 30 years.
- Economic benefits have been estimated at $15.1 billion over 30 years, and tax revenue growth of more than $800 million is projected over the same period.

The intermodal facility proposed for Prichard, WV is currently being studied. The construction cost of this intermodal facility is estimated at $18 million. The facility will be comparable in size and services to the proposed facility in the Roanoke Region.

The benefits of the intermodal facility have been estimated by the Marshall University's Rahall Transportation Institute (RTI). The preliminary benefits from double-stack clearance and the Prichard Intermodal Facility include:

- Cost savings to West Virginian shippers who currently must move containers by truck.
- Project benefits were estimated at $293 million by RTI study (assuming 6.5 percent growth in intermodal traffic, including West Virginia traffic from the new intermodal facility over a 20 year period, and a 6.125 percent discount rate).
- Economic value to regional shippers resulting from construction of Prichard Intermodal Facility - $50 million to $83 million.
- Reductions in fuel consumption and emissions are not quantified but expected to be large.
- Improved mobility for motorists and truck freight along the Heartland Corridor, including some mobility benefits on the I-81 segment between Staunton and Lexington, VA.
- Environmental benefits from reduced emissions by using more efficient rail.

- Economic, tax and employment benefits from the introduction of new or expanded intermodal capacity along the corridor.
- Preservation of rail infrastructure and employment on a rail corridor that is currently facing a decline in other traditional traffic, such as coal, within the Roanoke Region and West Virginia.
- Improved access to the global trade network for shippers and manufacturers in VA, WV, eastern KY and OH.

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3. DESCRIPTION AND COMPARATIVE ANALYSIS OF EXISTING INTERMODAL FACILITIES

3.1 Overview of Intermodal Facilities

The concept of an intermodal container facility is rather recent in the United States compared with Western Europe, where the concept dates to the 1970s. In the 1980s, U.S. intermodal facilities were predominately Trailer on Flat Car (TOFC) and served package and mail shippers like UPS and the US Postal service. The switch to Container on Flat Car (COFC) has developed as more imports have entered the U.S. market. Larger intermodal facilities are also called integrated logistics centers, logistics parks or freight villages depending on the level of service they provide and whether their service is integrated with local warehousing. An Integrated Logistics Center (ILC) is the hub of a specific area in which all the activities relating to transport, logistics and goods distribution are carried out by various operators.[1]

Overall, an intermodal facility serves two major goals:

- Bring together the flow of the freight transport managed by transportation and logistics operators to reduce costs and increase productivity; and
- Spur transportation and distribution-related economic activity (and potential benefits to the public) that is drawn to the area due to the consumer-related nature of intermodal freight.

Contrary to traditional freight rail yards, intermodal facilities are better integrated in the transportation logistics chain and the production process of firms. Intermodal yards are designed as facilities that provide movement between the modes. Rail yards serve as marshalling facilities to sort cars between regions, trains, and destinations. Rail yards are typically used by mixed carload trains. Bulk unit trains move very high volumes of a single commodity such as coal, grain, minerals and waste and are typically used to move the commodity between a limited number of origins and destinations. Mixed carload trains move various commodities, including chemicals, food products, forest products, waste and scrap between many origins and destinations where smaller quantities are handled. By contrast, intermodal facilities are both origins and destinations within the rail network, and are served primarily by intermodal trains carrying truck trailers and containers with consumer goods and higher-value and lower-weight commodities than those moved by bulk unit train or carload service. These centers involve multi-modal freight movement typically by rail on the long haul and truck on the short haul from product entry or origin to the center and intermodal facility to destination.

The size of an intermodal facility varies due to the demand for service, available land, and the local economic base. The size is often defined by the acreage of trailer space, or annual lift capacity in terms of a twenty-foot container equivalent unit, that is also referred to as a Trailer Equivalent Unit (TEU). Larger ILCs include warehouses and an intermodal terminal, where freight is conveyed from one mode of transportation to another (train-to-truck or truck-to-train, for instance). They often house distribution, manufacturing and processing sites as well as repair buildings (to ensure efficient, uninterrupted operations, as needed). Depending on its location and the range of its activities, an ILC can also provide customs services. Some ILCs include new

[1] Europlatforms EEIG, *Logistics Centres, Directions for Use*, January 2004, p. 3.

rail spurs directly to commercial establishments. This "all-in-one" concept aims to increase reliability, efficiency and synergy, and to provide a means to accelerate freight movement, handle more freight and reduce a wide array of costs.[2]

3.2 Intermodal Facilities in the United States

As mentioned above, COFC intermodal facilities and ILCs have appeared only recently in the United States. Most of the existing facilities have been built since the early 1990s. Intermodal facilities are generally located close to population centers, road networks and a rail intermodal facility. These areas exhibit a strong demand for the movement, storage and distribution of large volumes of consumer products. Two facilities, Rickenbacker and Pritchard, will also be located on the Heartland Corridor. Table 2 shows a sample of existing and planned/under construction logistics parks.

Table 2: Sample of Existing and Planned/Under Construction Facilities in the United States

EXISTING FACILITIES			
Name	**Location**	**Opening Year**	**Operator**
Logistics Park-AllianceTexas (Alliance Texas)	Fort Worth, TX	1994	BNSF
Logistics Park-Chicago (CenterPoint Intermodal Center)	Elwood, IL	2002	BNSF
Global III (CenterPoint Intermodal Center - Rochelle)	Rochelle, IL	2003	UPRR
Rickenbacker Intermodal Facility	Columbus, OH	2008	NS
Mesquite Intermodal Facility (Skyline Business Park)	Mesquite, TX	1997	UPRR
International Intermodal Center (Port of Huntsville)	Huntsville, AL	1991	Port of Huntsville
North Carolina Global TransPark	Kinston, NC	1995	NS
Dallas Intermodal Terminal (DIT)	Wilmer, TX	2005	UPRR
PLANNED OR UNDER CONSTRUCTION FACILITIES			
Name	**Location**	**Opening Year**	**Operator**
California Integrated Logistics Center	Shafter, CA	N/A	NWCS
Fulton Industrial District Integrated Logistics Center	Atlanta, GA	N/A	CSX
Kentucky Intermodal Park	Pulaski County, KY	N/A	N/A
Salt Lake City Intermodal Facility	Salt Lake City, UT	N/A	UPRR
Choctaw Point Intermodal Facility	Choctaw, AL	N/A	N/A
Prichard Intermodal Facility	Prichard, WV	2010	NS

Note: BNSF=Burlington Northern Santa Fe; NWCS=Northwest Container Service; NS=Norfolk Southern; UPRR=Union Pacific Railroad

[2] Yevdokimov, Yuri V., "Measuring Economic Benefits of Intermodal Transportation", *Transportation Law Journal*, June 2000.

3.3 Benefits of Intermodal Facilities

The most commonly assessed benefit category in existing case studies is the economic value (or the economic impacts). Intermodal facilities produce both short-term impacts (during the construction phase) and long-term impacts (during the operation phase). A comprehensive economic impact analysis should thus estimate (and differentiate between) these impacts. Economic impacts are measured in terms of business output (or volume of sales), value added (i.e., employee compensation and property income), employment, labor income and tax revenue (at the local, state and federal levels).

Economic impacts can be defined as the effects on the level of economic activity in a given area. Typically, economic impact analysis involves the estimation of three types of spending/production activity:

- *Direct effects* are the changes in local business activity occurring as a direct consequence of companies located in the logistics park;
- *Indirect effects* are the result of purchases by local firms who are the direct suppliers to the directly affected companies; and
- *Induced effects* are the changes in local business activity resulting from personal (household) spending for goods and services – including employees of directly and indirectly affected businesses.

The total economic value is the sum of the direct, indirect and induced effects of the integrated logistics center being evaluated.

A review of the literature on the economic impacts resulting from intermodal facilities/integrated logistics centers was conducted. The findings are summarized in Table 3 on the following page. Although these facilities differ with respect to size, location, and services provided, they offer a reasonable perspective on the potential economic impacts of an intermodal facility in the Roanoke Region.

Table 3: Economic Impacts Resulting or Expected from Intermodal Facilities

Name	Acreage	Opening Year	Operator[1]	Economic Impacts
EXISTING FACILITIES				
Logistics Park-Alliance Texas (Alliance Texas) *Fort Worth, TX*	11,600 (park-total) 1,700 (park-developed) 750 (facility)[2]	1994	BNSF	Number of Companies (2005): 140 Output (1990-2003): $23.2 billion Jobs (1990-2003): 20,000[3] Property Taxes (1990-2003): $313 billion
Logistics Park-Chicago *Elwood, IL*	2,200 (park-total) 770 (facility)	2002	BNSF	Jobs : 8,000-12,000 Property taxes (upon completion): $27 million per year Sales tax (construction materials cost): $108 million
Global III Intermodal Facility *Rochelle, IL*[4]	1,230 (facility-total) 843 (facility-developed)	2003	UPRR	Output (10-year period): $2.8 billion[5]
Rickenbacker Intermodal Facility *Columbus, OH*	300 (facility)	2006	NS	Output (30-year period): $15.1 billion Direct tax revenue (30-year period): $805 million Indirect tax revenue (30-year period): $1.26 billion Direct and indirect jobs (30-year period): 20,400 jobs
Mesquite Intermodal Facility *Mesquite, TX* [6]	155 (facility)	1997[7]	UPRR	Output (1995-2002): $280 million Direct jobs (1995-2002): 475
International Intermodal Center *Huntsville, AL*	6,080 (park-total) 40 (facility)	1991	NS	Direct and indirect jobs (2003): 24,654 Tax revenue: $171 million
Virginia Inland Port *Front Royal, VA*	161 (facility)	1989	VPA	Jobs: 6,500-7,000
PLANNED OR UNDER CONSTRUCTION FACILITIES				
Roanoke Intermodal Facility *Roanoke region*, VA	65 (or more)	2010	NS	*Jobs and economic impact – discussed in this report*
California Integrated Logistics Center *Shafter, CA*	N/A	N/A	NWCS	Jobs (upon completion): 800-1,000 Labor Income (upon completion): $40 million per year
Prince George Intermodal Terminal *Northern BC, Canada*	20 (facility)	2007	CN	Output: $84 million Jobs: 750
Choctaw Point Intermodal Facility *Choctaw*, *AL*	60 (facility)	N/A	N/A	Jobs: 1,696
Prichard Intermodal Facility *Prichard, WV*	108 (facility)	2010	NS	Jobs: 2,000-3,000

Comment: No Terminals near our size other than Huntsville and Pritchard

Notes: [1] CN=Canadian National Railway; [2] The estimate does not include the 327-acre expansion announced in November 2004; [3] Impacts are estimated for the entire AllianceTexas development, which includes the logistics park; [4] Adjacent to the intermodal facility is the CenterPoint Intermodal Center-Rochelle, a 362-acre industrial park which opened in 2004; [5] Preliminary estimates; an economic impact study is underway; [6] Adjacent to the intermodal facility is the Skyline Business Park, a 94-acre industrial park which opened in 2001; [7] Year of major expansion

Table 4 shows the number of jobs generated, or expected to be generated, by facilities in relation to the operational capacity (in thousands of TEUs per year). These data were gathered from an extensive search of available data and by contacting facilities directly. The data represent the current status of facilities and does not indicate potential future growth. Average jobs per 1,000 TEUs are computed for all existing facilities (58.0) and planned facilities (46.1). These facilities are all much larger or smaller than the facility averages. None of these facilities is close enough to the size and type of facility anticipated for Roanoke to be a direct comparison.

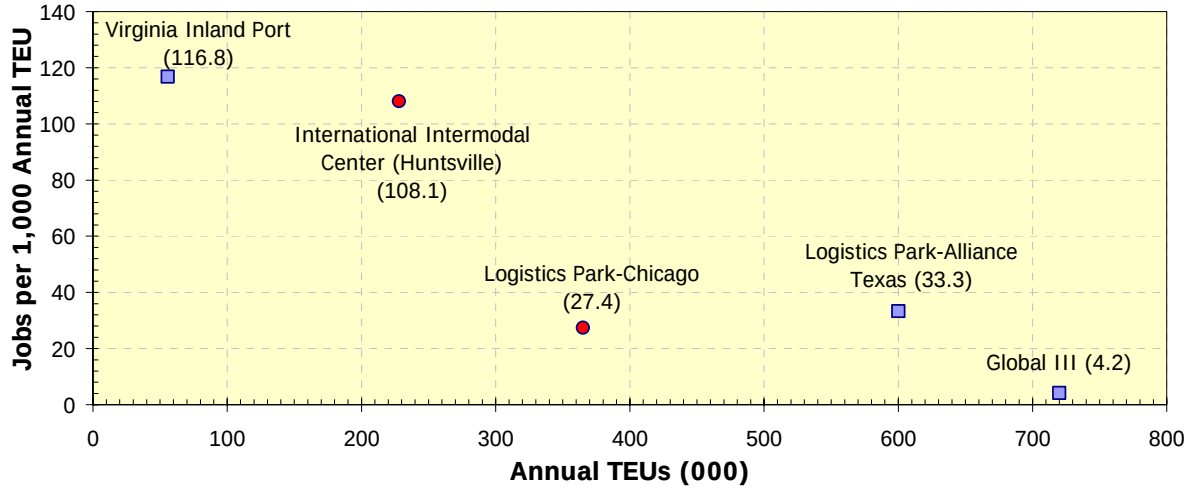
Table 4: Summary of Intermodal Data on Jobs and Lifts (TEUs)

Intermodal Facilities	Existing (E) / Planned (P)	Container Lifts (TEUs)	Jobs	Jobs per 1000 TEUs
Global III	E	720,000	3,000	4.2
International Intermodal Center (Huntsville)	E	228,000	24,645	108.1
Logistics Park-Alliance Texas	E	600,000	20,000	33.3
Logistics Park-Chicago	E	365,000	10,000	27.4
Virginia Inland Port	E	55,630	6,500	116.8
Choctaw Point Intermodal Facility	P	320,443	1,696	5.3
Prince George Intermodal Terminal	P	124,000	750	6.0
Rickenbacker Intermodal Facility	P	300,000	20,400	68.0
Average (Existing)				**58.0**
Average (Existing and Planned)				**46.1**

Figure 2 presents the data from Table 4 in terms of the number of jobs per 1,000 annual TEUs versus total annual TEUs. International Intermodal Center (Huntsville) and Logistics Park-Chicago are indicated with different symbols because they are used to assess potential impacts at Roanoke. These facilities are used for comparison because they are not the highest and lowest jobs per TEU lift ratio and they fall on either side of the median.

Figure 2: Comparison of Intermodal Facilities in Terms of Job Creation

Note: The values in parentheses are the jobs per 1000 TEUs generated at the intermodal facility



3.4 Other Costs and Benefits of Intermodal Facilities

Beyond the well-established and measured economic impacts, intermodal facilities can have positive and negative effects on local industries and the community at large, which are commonly referred to as *user benefits* and *social impacts*. Economic impacts are different from user benefits (of a particular facility) and broader social impacts – even though user benefits and social impacts include the dollar valuation of changes in amenity or quality of life factors such as air quality, safety and security. User benefits are usually considered in terms of the impact on users of a particular facility, in the case of an intermodal facility the benefits are associated with a more efficient production process (e.g., increase in freight volume and reduction in logistics cost). Social impacts include the benefits enjoyed by the local community (i.e., users and non-users of the intermodal facility) such as environmental impacts and potential accident cost savings as well as the opportunity cost of land developed for the intermodal facility. This cost may also involve a redistribution of transportation externalities.[3]

Economic Development

Economic development generally refers to the growth of existing local businesses and the arrival of new businesses to the region due to the intermodal facility. The economic development experience of smaller facilities such as the Virginia Inland Port and Mesquite Intermodal Facility has been noted above. Another example is the redevelopment and industrial conversion of the former Joliet arsenal in Illinois. The 27,000-acre military property was used to manufacture munitions and was once one of the largest employers in Chicago. In 2000, the U.S. Army transferred 2,032 acres to CenterPoint Properties to transform the property into an intermodal facility and an industrial business park. To date, the logistics park is more than 60 percent built out. According to a University of Illinois study, upon its completion, CenterPoint Intermodal Center is projected to create more than 8,000 new jobs and generate as much as $27 million in property tax revenue to local governments.

Production Process

Intermodal transportation can change the way firms do business and can affect their production process. These public *and* private benefits include an increase in the volume of transportation, a reduction in logistic costs, economies of scale associated with transportation network expansion, and better accessibility to input and output markets.

For instance, after joining AllianceTexas at Fort Worth, Texas in 1994, BNSF nearly doubled its volume of throughput at the intermodal facility in five years. Containerization of commodities being transported plus hubbing or cargo consolidation at the intermodal facility resulted in longer trains with higher frequency (taking trucks off the highways). Day-to-day operations at the intermodal facility are managed by the Optimization Alternatives Strategic Intermodal Scheduler (OASIS) computer system, in order to maximize terminal efficiencies and provide customers with tracking (visibility) of their shipments at all times (providing competitive advantages for local companies).

Also, intermodal facilities may significantly increase benefits through new technology. For instance, most of the recent logistics parks are using a high-tech, biometric secured, automated gate system (AGS) that decreases truck processing from a national average of four minutes to as little as 30 to 90 seconds, thus reducing truck idling and emissions.

[3] A summary of all benefit and impact metrics identified in this study is also provided in Appendix C.

Traffic Congestion

More than 75 percent of U.S. domestic freight tonnage is currently conveyed by trucks. Trucks are often regarded as a significant source of traffic congestion. The problem is most acute in congested areas with a high level of economic activities, where most of the freeways are at (or beyond) capacity during peak periods. On most freeways, an estimated 30 percent to 60 percent of the capacity is actually used by trucks. Also, truck-related accidents generate serious traffic congestion because they involve a larger number of lanes blocked or closed.

Freight rail combined with grade separation helps manage traffic congestion and provides improved reliability. An intermodal double-stack train can remove as many as 200 to 300 long haul trucks off the nation's major interstate highways. It is estimated that the future California Integrated Logistics Center in Shafter will eliminate millions of truck miles annually from the much-congested Interstate 5, between the port of Oakland and the ports of Los Angeles and Long Beach.[4] Similarly, a Roanoke Region Intermodal Facility could reduce trucks on the road, especially between the Port of Norfolk and the Roanoke region.

At the same time, intermodal facility-induced economic development necessarily involves increased freight movement, much of which will travel, at least initially, by truck. This is especially the case for smaller intermodal facilities, because new and existing businesses may have limited space to locate on-site. As a result, congestion could increase locally near the Roanoke Region Intermodal Facility even if overall highway congestion is reduced. This congestion could involve a redistribution of impacts from highways to local roads.

Environment

Air quality preservation is the most significant challenge for freight movement. Trucks predominantly use diesel fuels, a major source of NOx (an ozone precursor) and the primary mobile source of particulate matter. In general, train movements benefit the public by offering a cleaner alternative to trucks – they use less fuel and emit less pollution (per ton of freight transported). In addition, many intermodal facilities are equipped with gate systems using advanced technologies that help reduce truck idling, thereby improving air quality. For instance, all of Union Pacific Railroad's recent intermodal facilities are using new gate systems that decrease truck processing from four minutes to as little as 30 to 90 seconds. Facilities can also negatively impact local residents because of increased congestion-induced air pollution, scenic alterations, light pollution, or water quality changes. As a result, facilities often incorporate design features that attempt to minimize such negative impacts.

[4] Los Angeles County Metropolitan Transportation Authority, *Southern California Freight Management Case Study*, prepared for the Office of the Secretary of Transportation and the U.S. Department of Transportation, January 2002.

Safety and Protection

Safety is one of the top freight transportation priorities, because the interaction of passengers and freight on the transportation network creates significant safety concerns. There are far fewer total fatalities each year from truck-related accidents than from passenger-vehicle accidents. However, truck-related accidents tend to be more severe, involving a higher incidence of fatality, property damage and economic loss than non-truck related accidents. In addition, the truck-induced wear and tear on highways can be a source of accidents for other vehicles. Freight trains, by contrast, have a still lower accident rate than trucks. Accordingly, new development shipping through an intermodal facility reduces the total truck miles, but tends to increase trucking in the local area. Overall, shifting more freight movements from long haul highway trucks to rail transportation provides substantial benefits to the public in terms of accident cost savings.

A number of existing logistics parks are located in/near coastal areas that are prone to hurricanes. In the event of a hurricane, these large facilities could be used for emergency evacuation and recovery. For instance, the North Carolina Global TransPark served as a logistical staging area for rescue and relief operations following Hurricane Floyd in October 1999, providing the public with water, food and other essential items in the most time-sensitive manner possible.

Security

In the aftermath of 9/11, transportation security has become a major public concern and preoccupation for the U.S. Department of Transportation. The inspection of containers at U.S. ports of entry has increased dramatically. New intermodal facilities equipped with state-of-the-art security fencing, lighting and full gate inspections allow for improved security without hindering freight movement. For instance, at Union Pacific Railroad's Global III near Chicago, IL trucks gain access to the facility via a high-tech, biometric secured, automated gate system (AGS). Optical recognition is used to identify containers on trucks, and drivers are identified using digital scans of two fingers. The entrance lanes are also equipped with tire-flattening spikes that are operated in case of unauthorized entry. A truck entering or leaving the facility is stopped at the gate for less than two minutes, as compared to a national average of four minutes.

3.5 Examples of Intermodal Facilities

3.5.1 Virginia Inland Port - Virginia

The Virginia Inland Port (VIP) is a 161 acre, intermodal container transfer facility in Front Royal, VA. Opened in 1989 and operated by the Port of Virginia the facility has 17,820 feet of rail adjacent to the Norfolk Southern main line. VIP is easily accessible from I-81 and I-66 (Table 5). VIP is designed to service one train to and from Norfolk each day. In 2005, the facility handled over 35,000 containers (55,630 TEUs)[5].

[5] The estimate of annual TEUs at VIP was provided in conversation with Virginia Port Authority.

Picture: Virginia Inland Port – Front Royal, VA

Table 5: Roadway Access to Virginia Inland Port

Major Roadway	Distance in Miles to Corridor	Drive time to Corridor
I-81	9.4	9 minutes
I-66	2.5	2 minutes
Corridor H (WV SR-55)	13	15 minutes
Corridor E (I-70)	52	1 hour

Source: Rahall Transport Institute (2004)

VIP has spurred substantial economic growth in the region and is often referred to as an economic engine for the Commonwealth. Since opening, 24 major companies have located near VIP including DuPont, Family Dollar Inc., Ford Motor Co., Home Depot, Kohl's Corp., Kraft Foods Inc., Rite Aid Corp., Rubbermaid, and Sysco Corp. These companies have invested $600 million locally, generating an estimated 7,000 jobs for the Front Royal region.

The VIP target market includes the Ohio Valley and Appalachian regions in the states of Virginia, Maryland and Pennsylvania. Before the VIP opened, companies in this area shipped freight to ports in Baltimore and Philadelphia. The VIP became an attractive alternative by shortening the distance to Norfolk and lowering the cost of exporting and importing.

3.5.2 Mesquite Intermodal Facility - Texas

Opened in 1997 and operated by the Union Pacific Railroad, the Mesquite Intermodal Facility (MIF) is located in Mesquite, TX outside of Dallas. The MIF covers 155 acres and is located along the Union Pacific line near major roadways (I-20, I-30, I-635, SH 352 and US-80).

Picture: Mesquite Intermodal Facility

Adjacent to this intermodal facility is the Skyline Business Park which opened in 2001. The Skyline Business Park which covers 94 acres, was originally expected to generate 205 direct jobs and a total economic impact of $169 million through industrial development from 1995-2002. The actual economic impact has greatly exceeded initial projections with 475 direct jobs and a cumulative economic impact of $280 million.

4. ECONOMIC ASSESSMENT OF AN INTERMODAL FACILITY IN THE ROANOKE REGION

4.1 Estimation of Economic Impacts

An economic impact analysis was conducted to evaluate the incremental economic growth and additions to the tax base from candidate intermodal facilities located in the Roanoke Region (a socioeconomic profile of the study area is presented in Appendix A).

Three types of economic impacts were identified for this study:

- Short-term economic impacts associated with facility construction;
- Long-term economic impacts from facility operations[6]; and
- Long-term economic development impacts due to existing business growth and new businesses locating nearby with the direct intention of using the facility. For example, Swedwood, the IKEA Brand furniture-maker, has recently located in Pittsylvania County.

The primary measure of economic impacts is the increase in *output* in terms of the costs of materials and services associated with facility construction and operations. Output includes an additional measure, *value added*, which refers to labor compensation and net business income (after expenses). Finally, economic impacts also refer to increase in *tax revenue*, which is directly derived from increased output and value added.

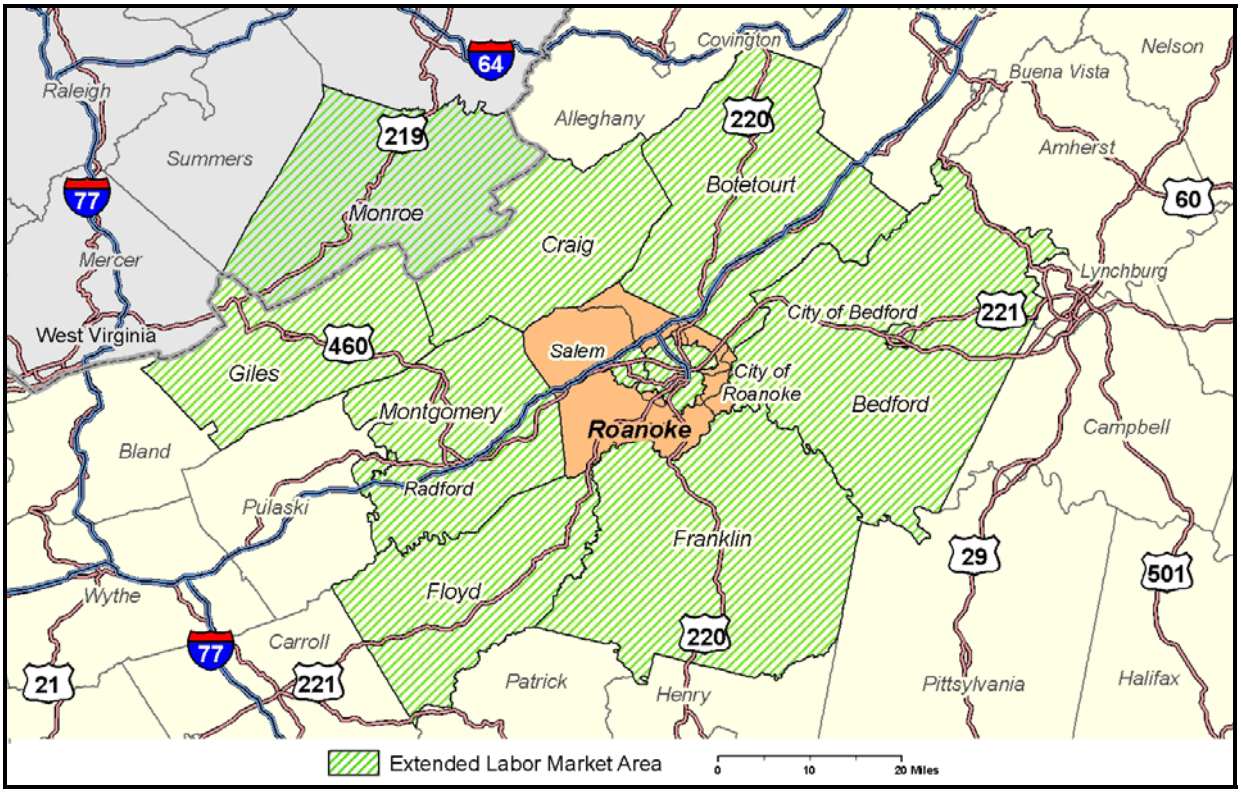
Economic output and value added from the facility may be subdivided into three components: direct, indirect and induced impacts. Direct impacts are driven by direct expenditures associated with operations at the facility. Indirect impacts refer to expenditures not directly associated with the facility but caused by operations there. Induced impacts are related to costs of materials and services that are not directly or indirectly associated with the construction of the terminal but occur because of the construction activity.

The study area is defined to be the towns and counties in and around the Roanoke region including the counties (Roanoke, Botetourt, Bedford, Franklin, Montgomery, Craig, Giles and Floyd) and independent towns (Lynchburg, Bedford, Salem, Roanoke and Radford) (See Figure 3). This study area reflects the primary market for labor, shipping, materials and indirect impacts. Businesses located outside this region would also consider using the proposed facility but it would depend on the specific variable costs and needs. Virginia state and county data for 2004 is used to estimate the economic impacts in IMPLAN (Impact Analysis Planning). IMPLAN is an input-output model that has been widely used in land use planning for nearly two decades.[7]

[6] Operations and maintenance only includes the costs for employees at the facility. Additional costs are currently not available. In addition, additional economic impacts from associated trucking operations at the facility are not included. As such, the annual benefits are a lower bound of the total impacts.

[7] An input-output model calculates impact multipliers, which are then used to estimate indirect and induced effects. Multipliers can be expressed in terms of output or jobs. An output multiplier is the total increase in business output (sales) for all industries, per dollar of additional final demand (purchases) of a given industry. A job multiplier is the total increase in jobs for all industries, per new job created in a given industry. The higher the multiplier the greater is the total economic response to the initial direct effect. Since the IMPLAN numbers were originally expressed in 2004 dollars, they were adjusted for inflation during the analysis to express the results in 2007 dollars.

Figure 3: Potential Market Area of the Roanoke Region Intermodal Facility



Acknowledging the uncertainty in the analysis, three scenarios are considered: a pessimistic (low) scenario, a most likely scenario and an optimistic (high) scenario. A number of assumptions are made for each scenario pertaining to (*i*) the total construction cost (including labor and equipment); and, (*ii*) the number of employees in the facility during operation. Table 6 summarizes the model assumptions for each case. The low and high scenarios assume simply that the costs and number of employees may be 20% lower or higher than the most likely estimate.

Table 6: Facility Assumptions

Input[8]	Most Likely	Low	High
Construction cost ($ Millions)	$26	$20.8	$31.2
Number of employees working at the intermodal facility	10	8	12

4.1.1 Economic Impacts from Site Construction

Economic impacts due to the construction of a facility in the Roanoke Region are proportional to the level of spending. Table 7 shows the results by economic impact category in millions of 2007 dollars. Here, *output* refers to all of the costs of materials and services associated with the construction of the terminal. *Value added* refers to the compensation paid to employees involved in the construction of the terminal, and the income (after expenses) of the business owners

[8] Construction costs are assumed to be reasonable for a intermodal facility in the Roanoke region. If actual costs are lower or high than this amount, impacts would be proportionally lower or higher.

involved in the construction of the terminal. Value added is included within output. Table 8 disaggregates results in Table 7 by presenting the short-term economic impacts associated with the construction of the facility in terms of direct, indirect and induced effects for each case. To clarify these differences, consider the following:

- *Direct Output* refers to the costs of materials and services directly related to the construction of the terminal;
- *Direct Value Added* refers to the compensation paid to employees directly involved in the construction of the terminal and the income (after expenses) of the business owners directly involved in the construction of the terminal;
- *Indirect Output* refers to the cost of materials and services of activities not directly associated with the construction of the terminal, but caused due to the construction of the terminal (for example, a company wins a big contract hauling steel to the terminal and therefore has to buy a fleet of new trucks to handle its increased business; the cost of the trucks is Indirect Output);
- *Indirect Value Added* refers to the compensation paid to employees indirectly associated with the construction of the terminal (for example, compensation paid to the truck drivers delivering steel to the terminal) and the business owner income after expenses of business owners indirectly associated with the construction of the terminal (for example, the income realized by the truck dealer who sold the trucks);
- *Induced Output* refers to the cost of materials and services that are not directly or indirectly associated with the construction of the terminal but occur due to the construction activity (for example, the fast food restaurant located down the street from the terminal may conduct 40% more business during the construction period);
- *Induced Value Added* refers to the compensation paid to employees not directly or indirectly association with the terminal construction (for example, the payroll for three new lunch-hour employees that the fast food restaurant hired) and the business owner income (after expenses) of such companies (for example, increased income for the fast food restaurant.)

In Table 7, the economic impacts are the following for the most likely outcome: **$48.2 million** in output, **$30.0 million** in value added, and **$6.7 million** in tax revenue. Almost a third of the tax revenue would be collected by local/state governments. Table 8 shows the disaggregated impacts from the facility for economic output, including **$28.8 million** as a direct effect, **$4.6 million** as indirect, and **$14.8 million** as induced.

Table 7: Total Economic Impacts of Construction Expenditures

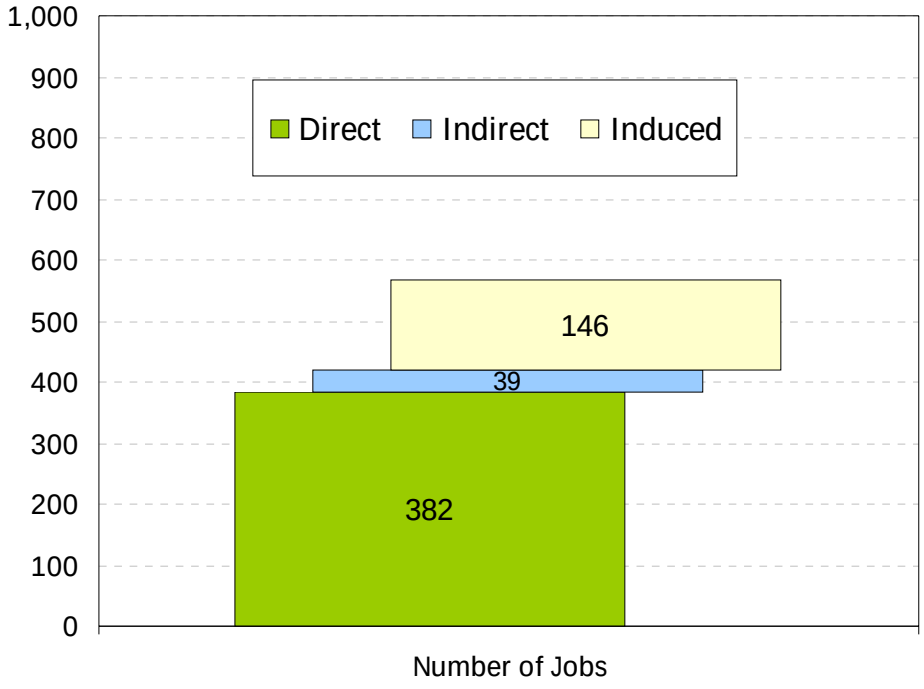
Impact Category	Most Likely	Low	High
Output ($ Millions)	**$48.2**	**$38.6**	**$57.9**
Value Added ($ Millions)	$30.0	$24.0	$36.0
Taxes ($ Millions)	**$6.7**	**$5.4**	**$8.1**
Federal Taxes	$4.7	$3.8	$5.7
State/Local Taxes	$2.0	$1.6	$2.4

Table 8: Direct, Indirect and Induced Effects of Construction Expenditures

Impact Category	Direct	Indirect	Induced	Total
MOST LIKELY				
Output ($ Millions)	**$28.8**	**$4.6**	**$14.8**	**$48.2**
Value Added ($ Millions)	$18.8	$2.4	$8.7	$30.0
LOW				
Output ($ Millions)	**$23.1**	**$3.7**	**$11.8**	**$38.6**
Value Added ($ Millions)	$15.1	$2.0	$7.0	$24.0
HIGH				
Output ($ Millions)	**$34.6**	**$5.5**	**$17.7**	**$57.9**
Value Added ($ Millions)	$22.6	$2.9	$10.4	$36.0

Figure 4 indicates that an additional **567** jobs would be created during the construction period due to spending.[9] A majority of these jobs (approximately 67 percent) are the direct effect of construction expenditures.

Figure 4: Construction Expenditures, Employment Impact, and Most Likely Outcome



[9] IMPLAN does not distinguish between full-time employees and part-time employees.

4.1.2 Economic Impacts from Facility Operations

The total annual economic impacts from operations are summarized in Table 9 and direct, indirect and induced effects are shown in Table 10. Here, *output* refers to the revenue generated by the services provided at the intermodal facility (for example, revenue generated by moving containers from the terminal via rail or storage fees for containers sitting at the terminal); *value added* refers to the compensation paid to employees working at the intermodal facility and the business owner income (after expenses) of the intermodal terminal operator. Value added is a component within output.

These estimated impacts represent the lower bound of total impacts from operations because operational expenses other than labor and expenditures from additional truck drivers using the facility are not included.[10] Under the most likely scenario, the output impact of operating the facility is estimated at **$4.4 million** per year, broken down as follows: **$2.9 million** in direct effects, **$0.5 million** in indirect effects and **$1.0 million** in induced effects. The facility is also expected to create **24 jobs**[11] in the region and generate **$0.6 million** in tax revenue.

Table 9: Annual Economic Impacts of Facility Operation

Impact Category	Most Likely	Low	High
Output ($ Millions)	**$4.4**	**$3.5**	**$5.3**
Value Added ($ Millions)	$2.7	$2.1	$3.2
Employment	**24**	**19**	**28**
Taxes ($ Millions)	**$0.6**	**$0.5**	**$0.7**
Federal Taxes	$0.4	$0.3	$0.5
State/Local Taxes	$0.2	$0.2	$0.2

Table 10: Annual Employment, Output and Value-Added Impacts of Facility Operations

Impact Category	Direct	Indirect	Induced	Total
MOST LIKELY				
Employment	**10**	**4**	**10**	**24**
Output ($ 2007 Millions)	**$2.9**	**$0.5**	**$1.0**	**$4.4**
Value Added ($2007 Millions)	$1.8	$0.3	$0.6	$2.7
LOW				
Employment	**8**	**3**	**8**	**19**
Output ($2007 Millions)	**$2.3**	**$0.4**	**$0.8**	**$3.5**
Value Added ($2007 Millions)	$1.4	$0.2	$0.5	$2.1
HIGH				
Employment	**12**	**5**	**12**	**28**
Output ($2007 Millions)	**$3.5**	**$0.6**	**$1.2**	**$5.3**
Value Added ($2007 Millions)	$2.1	$0.3	$0.7	$3.2

[10] No estimate is available at this time for these factors.
[11] This estimate includes the 10 jobs assumed for the operation of the intermodal facility.

4.1.3 Economic Impacts from Business Development

The impact of an intermodal facility on business growth is principally estimated by the annual number of jobs added to the local economy. Potential annual job growth is estimated from the experience of other facilities around the country.[12] Data from other facilities is however limited. In addition, it is not immediately apparent which of these facilities is more comparable to a proposed facility in the Roanoke Region. As discussed in Section 3.2, facilities represent a wide range of jobs generated per 1,000 TEUs.

Two values are chosen to represent the low and high scenarios for annual job growth. Focusing only on the existing facilities (and realized, not projected job growth), the second highest (International Intermodal Center, Huntsville) and second lowest (Logistics Park-Chicago) are used. The extreme job/TEU ratios at VIP and Global III are eliminated from consideration because they are assumed to be less likely to apply to Roanoke.

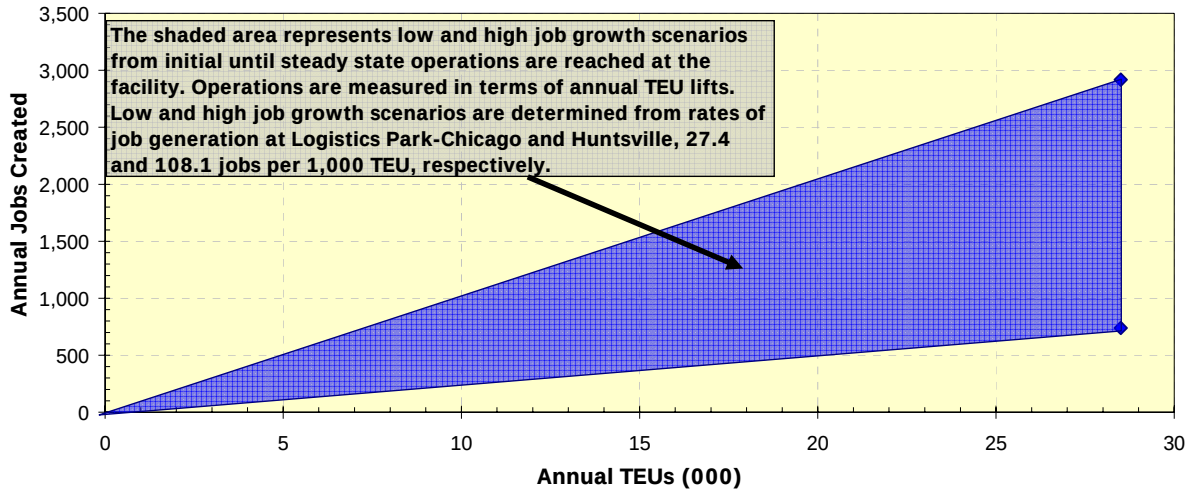
NS estimates that TEU lifts would be nearly 2,000 in the opening year and are expected to grow to a steady-state of 28,500 after 15 years of operations. Container boxes vary in length – with the vast majority (78%) being 40 feet in length (2 TEUs). The 28,500 annual TEU lifts estimated for the intermodal project equates to approximately 15,000 individual container lifts per year. The number of jobs associated with 28,500 TEU lifts is computed using 27.4 and 108.1 jobs per 1,000 TEU ratios for Logistic-Park Chicago and Huntsville, respectively (see Table 4). With these ratios, the potential steady-state low and high job creation ranges from 740 to 2,918 (Table 11). Figure 5 illustrates the range of potential job creation with increasing numbers of annual lifts. This wide range is principally due to the reliance on other studies and uncertainty about how comparable a facility at Roanoke would be to other facilities.

Table 11: Job Growth Scenarios

Roanoke Region Intermodal Facility Job Growth Scenario	**Jobs / 1000 TEU**	**Jobs Generated After 15 Years**
Low Ratio (Logistics Park – Chicago)	27.4	**740**
High Ratio (International Intermodal Center - Huntsville)	108.1	**2,918**

[12] Market research of companies that could potentially use the facility has not been conducted. If available, additional insight would be gained about the potential impact of the facility on new jobs.

Figure 5: Estimated Potential Long-Term Job Creation in the Roanoke Region



The job growth scenarios in Table 11 are used to estimate potential long-term annual economic impacts from new business development. Table 12 shows the potential long-term economic impacts from economic development by impact category (output, value added and tax revenue) given the high and low employment scenarios. Results show that potential long-term output is between **$139.5 million** and **$550.3 million**, and tax revenue between **$18.1 million** and **$71.4 million**. Table 13 shows the the total output.

Table 12: Potential Long-Term Economic Development Impacts of the Intermodal Facility

Impact Category	Low Estimated	High Estimate
Employment	**740**	**2,918**
Output ($ 2007 Millions)	**$139.5**	**$550.3**
Value Added ($ 2007 Millions)	$83.4	$329.1
Taxes ($ 2007 Millions)	**$18.1**	**$71.4**
Federal Taxes	$12.1	$47.6
State/Local Taxes	$6.0	$23.8

Table 13: Potential Economic Development Impacts Relative to the Roanoke Region

Low Scenario			
Impact Category	**Most Likely**	**Impact Relative to Study Area Total**	**Study Area Totals in 2004**
Output ($ 2007 Millions)	**$139.5**	**0.35%**	**$40,198**
Value Added ($2007 Millions)	$83.4	0.40%	$20,833
High Scenario			
Impact Category	**Most Likely**	**Impact Relative to Study Area Total**	**Study Area Totals in 2004**
Output ($2007 Millions)	**$550.3**	**1.37%**	**$40,198**
Value Added ($2007 Millions)	$329.1	1.58%	$20,833

4.1.4 Total Economic Impacts

Economic output, as discussed above, is the primary indicator of total economic impacts. Previous tables report values in annual impacts. The cumulative impacts over 15- and 30-year horizons can be computed from annual values for the low and high scenarios. Total employment is computed as a job-year, that is, the number of employed positions that would be filled by a person. These positions are not the number of jobs created since the same person could hold the same position for a number of years. Cumulative impacts for economic output and revenue are discounted to the present assuming a 4% real discount rate. These results indicate that the region could benefit from thousands or tens of thousands of employed positions over 15 and 30 years. The total discounted economic output from the project, over 15 years, ranges from about **$0.6 billion** to **$2.0 billion**, and over 30 years, from about **$1.5 billion** to **$5.5 billion**. Increased tax revenue (discounted to the present) ranges from about **$70 million** to **$270 million** in 15 years and **$190 million** to **$720 million** in 30 years.

Table 14: Cumulative Impacts: Employment, Economic Output, and Tax Revenue

Scenario	Total Employment (Job-Years)	Economic Output (present value in $ millions)	Tax Revenue (present value in $ millions)
15 Year Horizon			
Low	4,500	$570	$70
High	16,200	$2,050	$270
30 Year Horizon			
Low	15,600	$1,470	$190
High	59,500	$5,550	$720

4.2 Estimation of Public Benefits and Costs

Public benefits from an intermodal facility in the Roanoke region are estimated based on a combined project with the tunnel clearances along the Heartland Corridor. Benefits accrue from an increased use of rail (and a corresponding decrease in the use of trucks) for shipments to and from Norfolk.

Public benefits of an intermodal facility are assessed as part of the entire Heartland Corridor Initiative. NS anticipates that the Heartland Corridor will increase container movement by 25,000 in the first year of operations. Containers will annually grow by 25,000 per year until steady-state demand is reached at 150,000 containers (Table 15). It is assumed that without the Heartland Corridor improvements, these containers would travel by road.

For the purpose of this economic assessment, the Virginia share of costs for the entire project could potentially be $35.2 million which includes a 70% share of the total intermodal facility cost, or $25.4 million, plus $9.75 million, which is the 70% state contribution for the work on tunnel clearances. It is assumed that construction would require two years to complete and that benefits would accrue thereafter.

Table 15: Net Public Benefits from the Heartland Corridor Initiative

Year	Incremental Demand (Units)	Total Public Cost of $35,195,000
2008	-	$17,597,500
2009	-	$17,597,500
2010	25,000	
2011	50,000	
2012	75,000	
2013	100,000	
2014	150,000	
>2015	150,000	

Categories of benefits from shipping by rail instead of road include reduced congestion, reduced air and noise emissions, reduced pavement maintenance, and increased safety. Unit costs for each of these categories are drawn from independent regional and national studies (Table 16) as discussed in Appendix B. It is also assumed that the average weight of a container is 20 tons.

Table 16: Benefit-Cost Model Parameters

	Trucks	Train
Travel Distances by Mode		
Road Miles in VA	271	
Rail Miles in VA (difference before-after project)		224
Unit Costs		
Congestion cost per mile	$0.0291	n/a
Air pollution cost per ton mile	$0.0027	$0.0001
Noise pollution cost per ton mile	$0.0001	$0.0005
Pavement maintenance cost per mile	$0.1837	n/a
Accident cost per ton mile	$0.0079	$0.0023

The public cost-benefit analysis results indicate that the entire project, including tunnel clearances and the intermodal facility, yields a positive net benefit for Virginia. For the 15- and 30-year planning horizons, the benefit-cost ratios are **4.0** and **6.8**, respectively (a ratio of 1.0 is the minimally acceptable value). As such, this project satisfies the statutory requirement of state rail investments. Net present values are $100 million and $193 million, respectively. The internal rates of return are well above 20% and the investment payback would be achieved in about five years.

Table 17: Public Benefit-Cost Analysis Results

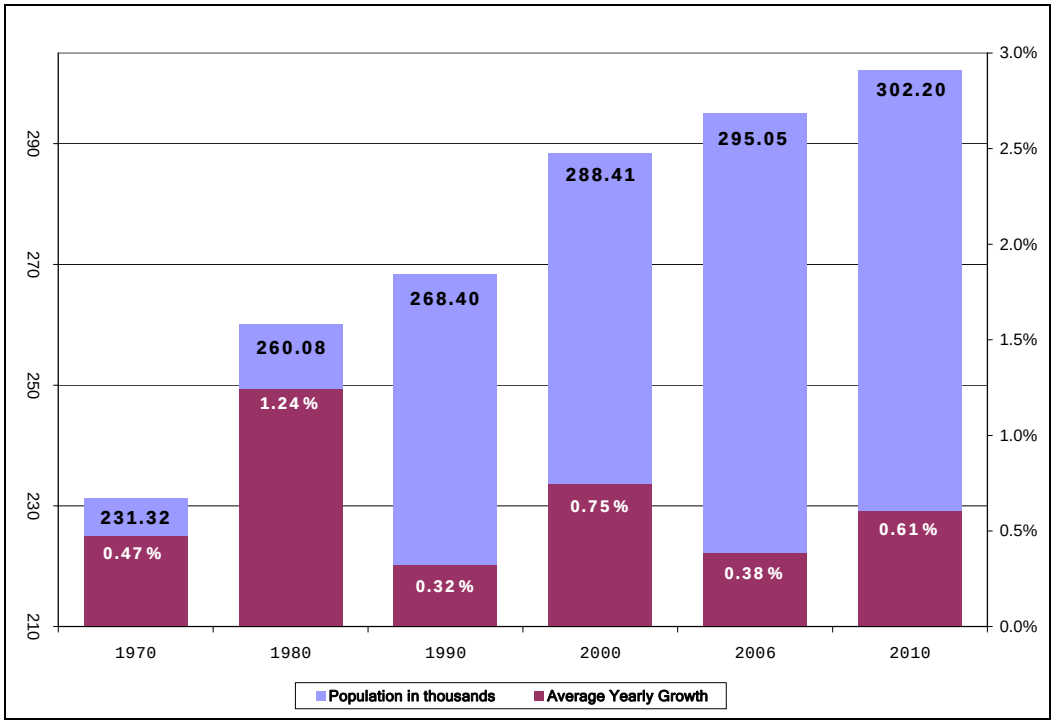
Benefit Category	15-Year Total (Discounted)	30-Year Total (Discounted)
Savings in Congestion Cost	$9.81M	$16.56M
Savings in Pavement Maintenance	$61.88M	$104.47M
Savings in Environment/Pollution Cost	$16.37M	$27.64M
Savings in Accident Cost	$45.75M	$77.24M
TOTAL BENEFITS	**$133.82M**	**$225.90M**
Benefit-Cost Results	**15-Year Total**	**30-Year Total**
BENEFIT-COST RATIO	**4.0**	**6.8**
NET PRESENT VALUE	**$100.63M**	**$192.71M**
PAYBACK PERIOD (Years)	**5**	**5**
IRR	**24.4%**	**25.4%**
Side Benefits	**15-Year Total**	**30-Year Total**
Number of Trucks Reduced on Highway	1,900,000	4,150,000
Fuel Savings (Millions of gallons)	189.0	467.2
Tons of CO2 Avoided	706,850	1,543,910

4.3 Discussion

Results of this analysis indicate that the intermodal facility would provide a strong economic stimulus to the region. IKEA's decision to locate its Swedwood unit in Virginia was partially attributable to the planned facility. The Heartland Corridor Initiative and intermodal facility stand to generate substantial public benefits for the state.

It may be noted that if Virginia does not invest in the intermodal facility or delays investment for 10 or 20 years, the potential economic impacts could be reduced because the other intermodal facilities along the Heartland Corridor would solidify their market presence.

Figure 6: Roanoke Metropolitan Statistical Area (MSA) Population



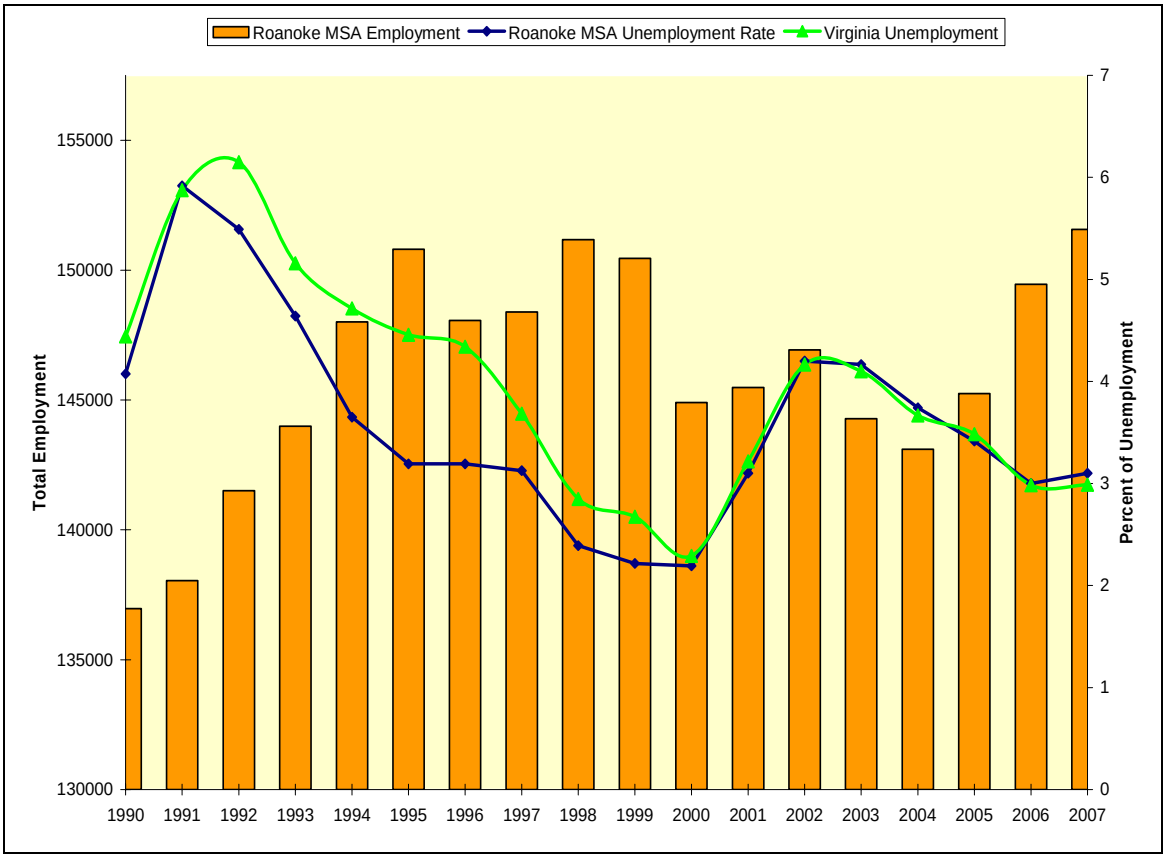
Source: US Census Bureau, County Population Estimates

Table 18: Roanoke MSA People, Business and Geography Facts

People	Roanoke MSA	Virginia
Population, 2006 estimate	295,050	7,642,884
Population, percent change, April 1, 2000 to July 1, 2006	2.34%	8.00%
Population, 2000	288,309	7,078,515
Persons under 5 years old, percent, 2005	5.77%	6.8%
Persons under 18 years old, percent, 2005	22.18%	24.1%
Persons 65 years old and over, percent, 2005	15.82%	11.4%
Households, 2000	119,366	2,699,173
Persons per household, 2000	2.50	2.54
Median household income, 2005	45,825	51,103
Persons below poverty, percent, 2004	10.5%	9.5%
Business		
Private nonfarm establishments, 2005	8,430	1,930,671
Private nonfarm employment, 2005	136,760	30,601,271
Private nonfarm employment, percent change 2000-2005	-1.8%	5.4%
Geography		
Land area, 2000 (square miles)	1,874	39,594
Persons per square mile, 2000	153.9	179

Source: Constructed from U.S. Census Bureau Composite Communites QuickFacts Sheets

Figure 7: Employment and Unemployment Rates (1990 – 2006)



Source: Bureau of Labor Statistics

Table 19: Roanoke MSA Employment by Sector (2004)

INDUSTRY	Roanoke MSA	Virginia
Agriculture, forestry, fishing and hunting, and mining	1,460	1.1%
Construction	9,266	6.9%
Manufacturing	17,169	12.9%
Wholesale trade	5,397	4.0%
Retail trade	17,168	12.9%
Transportation and warehousing, and utilities	9,095	6.8%
Information	2,962	2.2%
Finance and insurance, and real estate and rental and leasing	12,215	9.2%
Professional, scientific, and management, and administrative and waste management	9,336	7.0%
Educational services, and health care, and social assistance	26,497	19.9%
Arts, entertainment, and recreation, and accommodation, and food services	9,029	6.8%
Other services, except public administration	9,667	7.2%
Public administration	4,129	3.1%
Total	**133,390**	**100.0%**

Source: US Census Bureau

Table 20: Major Manufacturing Employers in Roanoke MSA

Employer	Product	Number of Employees
General Electric	Industrial Controls	600-999
ITT Industries	Night vision products	1,000 – 1,499
MW Manufacturers	Wood window / door units	1,000 – 1,499
Yokohama Tire Corporation	Tires	600-999

Source: Virginia Economic Development Partnership

APPENDIX B: NET BENEFITS MATRIX

The measures of net benefits are arranged by broader benefit category (environment, safety, etc.). The table indicates whether these measures can be expressed in dollar values, and the extent to which they have been documented for existing or potential sites. Net changes in benefits represent potential tradeoffs in benefits from reduced highway use and potential increased local traffic. More "*" in "Data Availability" indicate more studies that have undertaken such analyses.

BENEFIT CATEGORY	BENEFIT/IMPACT METRIC	DESCRIPTION	UNIT	MONETIZABLE (Yes/No)	DATA AVAILABILITY
Production Process	Freight volume	Increase in the volume of freight carried	Tons, ton-miles, dollars	Yes	***
	Logistics cost	Decrease in logistics cost	Dollars per ton	Yes	***
	Transportation cost	Decrease in transportation cost (e.g., drayage cost may be entirely eliminated)	Dollars per ton-mile	Yes	**
	Transportation network	Economies of scale associated with transportation network expansion	Tons, dollars	Yes	***
	Synergy and market access	Better access to input and output markets	Distance in miles to input and output markets	No	***
Economic Value	Business output	Gross output, measured by the total value of purchases by intermediate and final consumers	Dollars	Yes	***
	Value added	Net output, i.e. employee compensation and property income (interest, rent and profits)	Dollars	Yes	*
	Employment	Number of full-time and part-time jobs by industry (warehousing, transportation, distribution, manufacturing, etc.)	#	Yes	***
	Labor income	Salaries and wages earned	Dollars	Yes	***
	Tax revenue	Tax revenue (property tax, income tax, etc.) at the local, state and federal levels	Dollars	Yes	***
Economic Development	Redevelopment	Redevelopment of underutilized land (e.g., old military facilities)	Acre	Yes	**
	New businesses	Ability to retain existing businesses and attract new businesses to the area	Number of companies	Yes	**
	Number of residential properties	Change in the number of residential properties	#	Yes	*
	Residential property value	Change in the value of residential properties	Dollars	Yes	*

BENEFIT CATEGORY	BENEFIT/IMPACT METRIC	DESCRIPTION	UNIT	MONETIZABLE (Yes/No)	DATA AVAILABILITY
Congestion Relief	Traffic	Net reduction in truck traffic on highways	Trucks as a percentage of AADT	No	**
	Travel time	Net reduction in delays experienced by all users of the highway network	Person-hours of delay, ton-hours of delay	Yes	**
	Travel time reliability	Net increase in travel time reliability	% of container deliveries on time	No	*
	Vehicle operating cost	Net reduction in out-of-pocket expenses associated with owning, operating, and maintaining a vehicle (fuel consumption, oil consumption, maintenance and repairs, etc.)	Cost per mile	Yes	**
Environment	Fuel consumption (or energy intensity)	Net reduction in fuel (or energy) consumption as a result of a shift from truck to rail or technology advances reducing truck processing time at intermodal facilities	Ton-miles per gallon, Btu per ton-mile	Yes	**
	Air quality	Net reduction in emissions of pollutants (nitrogen oxides, volatile organic components, sulphur oxides, particulate matter of 10 microns or less, carbon monoxide) and greenhouse gases (carbon dioxide)	Tons	Yes	**
	Land development / Siting	Development location has a concentrated impact on local residents. Associated net benefits should characterize distribution of regional and local impacts. Values can be measured in stated preference surveys.	$/Household	Partial	0
	Noise and vibrations	Net reduction in vibrations and noise level. The length and the timing of exposure should also be considered.	Decibels	Yes	*
Safety	Property damage only accidents	Net reduction in the number and cost of property damage only accidents	Accidents per ton-mile, accident cost	Yes	**
	Injury accidents	Net reduction in the number and cost of injury accidents	Accidents per ton-mile, accident cost	Yes	**
	Fatal accidents	Net reduction in the number and cost of fatal accidents	Accidents per ton-mile, accident cost	Yes	**
Security	Criminal acts	Net reduction in criminal acts (e.g., thefts)	#, dollars	Yes	*
	Smuggling of illegal/controlled substances and materials	Interception of illegal/controlled substances and materials	Tons or dollars	Yes	*
Hurricane Relief	Evacuation of population	Number of people evacuated	Number of people evacuated	No	*
	Recovery and aid	Medical supplies, food, tents and other supplies and equipment transported	Tons, dollars	Yes	*

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